WE CLAIM:

1. A support assembly for supporting a substrate holder during substrate processing, comprising a substrate holder support configured to prevent rotational slippage of the substrate holder support relative to a rotational drive.

2. The support assembly of Claim 1, wherein the substrate holder support further comprising a rotational drive interface, the rotational drive and the rotational drive interface being shaped to precisely fit together to prevent rotational slippage of the substrate holder support relative to the rotational drive.

3. The support assembly of Claim 2, wherein the rotational drive is shaped to have a non-rounded section.

4. The support assembly of Claim 1, further comprising:

a retaining member configured to couple the substrate holder support to the rotation member to thereby prevent rotational slippage.

5. The support assembly of Claim 4, wherein the retaining member comprises an elongated rod flexible along its length, a first end of the rod configured to be inserted into the socket opening, a second end of the rod configured to be inserted into another opening of the substrate holder support when the rod is flexed.

6. The support assembly of Claim 4, wherein the retaining member is selectively removable.

7. The support assembly of Claim 6, wherein the retaining member has a higher position in which the retaining member can be slidably removed from the passage, the retaining member having a lower position in which the extensions straddle the wall portion, the retaining member being biased toward the lower position by gravity.

8. The support assembly of Claim 4, wherein the rotational drive comprises a shaft having at least one indentation in an end portion of the shaft,

the retaining member comprising a retaining portion and two elongated generally parallel extensions extending from the retaining portion, and

the substrate holder support comprising a socket and a plurality of arms extending generally radially outward and upward from the socket, the arms being configured to support an underside of a substrate holder, the socket being configured

to receive the end portion of the shaft such that the end portion is rotatable within the socket about a longitudinal axis of the shaft, an opening being located in a sidewall of the socket and in one of the arms of the support member, the opening and the at least one indentation being configured so that when the shaft is rotated to a locking position with respect to the socket, the at least one indentation and the opening together form a passage sized and configured to removably receive the retaining member such that the extensions straddle a wall portion of said one of the arms to retain the retaining member within the passage, wherein insertion of the retaining member into said passage prevents the substrate holder support from rotating independently of the shaft.

9. The support assembly of Claim 4, wherein the retaining member is permanently installed.

10. The support assembly of Claim 4, wherein the rotational drive is an elongated shaft having a longitudinal axis and an outer surface, the shaft having at least one indentation in the outer surface, the indentation being configured to be engaged by the retaining member.

11. The support assembly of Claim 10, wherein the at least one indentation comprises three indentations, the retaining member being configured to engage with any one of the indentations.

12. The support assembly of Claim 11, wherein the three indentations are spaced apart equally about a perimeter of the shaft.

13. The support assembly of Claim 10, wherein one end of the shaft includes a tapered surface and the at least one indentation is located on the tapered surface.

14. The support assembly of Claim 10, wherein the at least one indentation consists of only one indentation.

15. The support assembly of Claim 10, wherein the retaining member, and at least one indentation are configured so that the retaining member does not prevent the substrate holder support from being lifted vertically with respect to the shaft when the retaining member is inserted into both the opening and the at least one indentation.

16. The support assembly of Claim 4, wherein the retaining member comprises a ceramic material.

17. The support assembly of Claim 16, wherein the retaining member comprises quartz.

18. The support assembly of Claim 4, wherein the rotational drive comprises a shaft having at least one indentation and the substrate holder support comprises a socket configured to receive a portion of the shaft, the support having an opening located in a sidewall of the socket, the support being configured so that insertion of the retaining member into the opening engages the retaining member with the at least one indentation in the shaft to prevent rotation of the substrate holder support with respect to the shaft.

19. The support assembly of Claim 18, wherein the opening and the at least one indentation, when aligned, together form a passage configured to receive the retaining member.

20. The support assembly of Claim 18, wherein the opening comprises an elongated slot, the retaining member being sized and configured to be received within and occlude substantially the entire length of the slot.

21. The support assembly of Claim 20, further comprising a lock for selectively securing the retaining member in the slot.

22. The support assembly of Claim 21, wherein the retaining member includes one or more ears protruding from the retaining member, each of the one or more ears having holes, the substrate holder support having one or more ear-slots configured to receive the one or more ears when the retaining member is received within the slot, the lock comprising one or more locking pins configured to be received within the holes of the one or more ears such that the locking pins prevent removal of the one or more ears from the one or more ear slots.

23. The support assembly of Claim 18, wherein the retaining member comprises:

a first extension configured to be removably inserted into a second opening in the substrate holder support;

a second extension configured to be removably inserted into the opening in the sidewall of the socket in engagement with the at least one indentation; and

a spring portion connecting the first and second extensions and being configured so that when both the first extension is inserted into the second opening and the second extension is inserted into both the opening in the sidewall of the

socket and the at least one indentation, the spring portion biases the second extension against the at least one indentation to prevent the substrate holder support from rotating with respect to the shaft.

24. The support assembly of Claim 18, wherein the retaining member has a first end and a second end oriented generally transverse to the first end, the first end configured to be inserted into the opening in engagement with the shaft indentation, the first end being rotatable within the opening such that the second end is movable between a first position and a second position, wherein when the second end is in the second position the first end is prevented from being pulled out of the opening and the indentation by a securing element of the substrate holder support bearing against the second end, and wherein when the second end is in first position the first end can be freely pulled out of the opening and the indentation.

25. The support assembly of Claim 18, wherein the opening is substantially cylindrical and the retaining member includes a substantially cylindrical end portion configured to be removably and slidably inserted into the opening.

26. The support assembly of Claim 25, wherein the end portion of the retaining member is configured to substantially fill the opening.

27. The support assembly of Claim 18, wherein a wall portion of the substrate holder support is configured to reside between two prongs of the retaining member, the retaining member having a first position in which the retaining member can be slidably removed from the opening, the retaining member having a second position in which the prongs straddle the wall portion to lock the retaining member onto the substrate holder support, the retaining member being biased toward the second position by gravity.

28. The support assembly of Claim 18, wherein the substrate holder support is configured to support a substrate holder for holding a semiconductor wafer.

29. The support assembly of Claim 28, wherein the substrate holder is configured to support a 300 mm wafer.

30. The support assembly of Claim 18, wherein the substrate holder comprises a susceptor.

31. The support assembly of Claim 18, wherein the substrate holder support includes a plurality of arms extending generally radially outward and upward from the socket, the arms configured to support a substrate holder.

32. The support assembly of Claim 1, wherein:

the rotational drive comprises a shaft having at least one indentation in a tip portion of the shaft,

the substrate holder support having a plurality of arms for supporting an underside of a susceptor and a socket that receives the tip portion of the shaft, the arms extending generally radially outward and upward from the socket, the support member further having a first opening located in a sidewall of the socket; and

the support assembly further comprises a retaining member comprising:

a first extension configured to be removably inserted into a second opening in one of the arms;

a second extension configured to be removably inserted into the first opening of the socket into engagement with the at least one indentation; and

a spring portion connecting the first and second extensions and being configured so that when both the first extension is inserted into the second opening in said one of the arms and the second extension is inserted into the first opening of the socket into engagement with the at least one indentation, the spring portion biases the second extension into the at least one indentation to prevent the susceptor support from rotating with respect to the shaft.

33. The support assembly of Claim 32, wherein the spring portion is generally U-shaped when the first extension is inserted into the second opening in said one of the arms and the second extension is inserted into the first opening.

34. The support assembly of Claim 32, wherein the plurality of arms of the support member comprises three arms.

35. The support assembly of Claim 1, wherein the rotational drive is a rotation shaft having at least one indentation in an end portion of the shaft and the substrate holder support comprises a support member comprising a socket and a plurality of arms extending generally radially outward and upward from the socket, the arms being configured to support

an underside of a wafer holder, the socket configured to receive the end portion of the shaft so that the end portion can be rotated within the socket about a longitudinal axis of the shaft, a socket opening being located in a sidewall of the socket, a first arm opening being located in one of the two support arms, a second arm opening being located in the other of the two support arms; the support assembly further comprising:

an elongated primary retaining member having a central portion and first and second locking portions, the primary retaining member having a locking position in which the primary retaining member prevents relative rotation between the shaft and the spider;

wherein in the locking position of the primary retaining member the central portion is removably inserted into both the socket opening and the at least one indentation, and the first and second locking portions are removably inserted into the first and second openings, respectively, wherein when the locking portions are secured the primary retaining member is substantially retained in the locking position.

36. The support assembly of Claim 35, wherein each of the locking portions has an opening that removably receives a secondary retaining member configured to secure the locking portions within one of the first and second openings.

37. The support assembly of Claim 36 wherein the secondary retaining members comprise locking pins.

38. The support assembly of Claim 4, wherein the retaining member secures the substrate holder to the rotational drive to prevent rotational slippage while allowing the substrate holder to be lifted free of the rotational drive.

39. A substrate processing system, comprising:

a support member having a receptor and a plurality of arms extending generally radially outward from the receptor, the arms being configured to support an underside of a holder, the receptor having an hole in a sidewall of the receptor;

a locking key; and

a rotational linkage having an end portion configured to be received within the receptor such that the rotational linkage is at least partially rotatable with respect to the receptor about a longitudinal axis of the rotational linkage, the end portion having

at least one retaining surface, the at least one retaining surface and the hole configured so that when the rotational linkage is rotated to a locking position, the at least one retaining surface and the hole together form a passage sized and configured to receive the locking key in a manner such that the locking key prevents the support member from rotating independently of the rotational linkage.

40. The system of Claim 39, wherein the locking key locks the support member to the rotational drive with respect to rotationally and horizontally applied forces without locking the support member to the rotational drive with respect to vertically applied forces.

41. A method of assembling a rotating susceptor assembly for a semiconductor processing system, comprising coupling a substrate holding structure to a rotational linkage so as to prevent rotational slippage of the susceptor holding structure relative to the rotational linkage during rotation of the substrate holding structure.

42. The method of Claim 41, wherein coupling further comprising linking the rotational linkage to the substrate holding structure using a linking member which prevent rotational slippage by engaging a hole in the substrate holding structure and contacting a contact surface of the rotational linkage.

43. The method of Claim 41, wherein coupling the substrate holding structure to the rotational linkage comprises coupling the substrate holding structure to the rotational linkage with respect to rotational forces, while allowing the substrate holding structure to be lifted in a direction parallel with a longitudinal axis of the rotational linkage.

44. A method of rotating a substrate comprising rotating a susceptor assembly by coupling a substrate holding assembly to a rotational linkage so as to prevent rotational slippage of the susceptor holder support relative to a rotational source during rotation of the substrate holding assembly.

45. The method of Claim 44, wherein coupling comprises:

aligning a shaped section of the rotational linkage with a correspondingly shaped portion of the susceptor holder support; and

lowering the susceptor holder support onto the rotational linkage.

46. The method of Claim 44, wherein coupling comprises:

inserting a linking member into an opening in the substrate holding assembly;

rotating the substrate holding assembly and the rotational linkage with respect to one another; and

engaging the linking member with the substrate holding assembly and the rotational linkage of the rotational source so that the substrate holding assembly is prevented from rotating independent of the rotational linkage.

47. The method of Claim 46, wherein the substrate holding assembly comprises a substrate holder and a substrate holder support and the rotational linkage comprises a shaft coupling the substrate holder support to the rotational source.

48. The method of Claim 47, wherein inserting the linking member is conducted prior to engaging the substrate holder support to the shaft.

49. The method of Claim 48, wherein engaging comprises rotating the substrate holder support and the shaft with respect to one another until the substrate holder support drops on the shaft with the linking member engaged with an indentation in a curved surface of the shaft.

50. The method of Claim 49, further comprising:

lifting the substrate holder support to a partially engaged position;

rotating the support less than one full rotation; and

dropping the support into a second fully engaged position.

51. The method of Claim 47, wherein coupling comprises:

after inserting the linking member into the opening, inserting an end portion of the shaft into a socket of the substrate holder support, the opening formed in a wall of the socket, the shaft end portion having one or more linking member contact surfaces, the method further comprising:

rotating the shaft and support with respect to one another about a longitudinal axis of the shaft until the opening and the one of the linking member contact surfaces together form a passage with the linking member therein so that the linking member prevents the substrate holder support from rotating with respect to the shaft; and

subsequently rotating the shaft about its longitudinal axis to thereby rotate the wafer holder support.

52. The method of Claim 47, further comprising:

inserting an end portion of the shaft into a socket of substrate holding assembly, the opening formed in a wall of the socket, the shaft end portion having a linking member contact surface;

aligning the linking member with a corner region between two adjacent support arms of the substrate holding assembly, the arms extending generally radially outward from the socket and configured to support the substrate holder, the opening being located in the corner region;

inserting a central portion of the linking member into the opening, while also inserting first and second locking portions of the linking member through first and second slots in the adjacent support arms;

holding the linking member in a locked position by locking in place the locking portions so that the locking portions are prevented from being pulled out of the first and second slots; and

rotating the shaft about its longitudinal axis to thereby rotate the substrate holding assembly.

53. The method of Claim 52, further comprising, prior to inserting the central portion of the linking member, rotating the substrate holding assembly with respect to the shaft about a longitudinal axis of the shaft until the opening and the contact surface together form a space shaped for receiving the linking member.

54. The method of Claim 52, further comprising, after inserting the central portion of the linking member, rotating the substrate holding assembly with respect to the shaft until the linking member contacts the contact surface and the assembly and the shaft are fully engaged.

55. The method of Claim 52, wherein holding the linking member in a locked position comprises inserting secondary linking members in openings in each of the locking portions.

56. The method of Claim 55, wherein the secondary linking members comprise pins.

57. The method of Claim 46, wherein the linking member substantially occludes the passage.

58. The method of Claim 46, further comprising retaining the linking member within the passage by positioning two generally parallel arms of the linking member to straddle a wall portion of the substrate holding assembly.

59. The method of Claim 46, wherein inserting the linking member into the opening comprises inserting a first end of a rod into the opening, the method further comprising retaining the linking member within the opening by elastically bending at least a portion of the rod and inserting a second end of the rod into a second opening in a portion of the substrate holding assembly.

60. The method of Claim 46, wherein inserting the linking member into the opening comprises inserting a first portion of the linking member into the opening, the method further comprising retaining the first portion of the linking member within the opening by rotating the linking member within the opening so that a second portion of the linking member generally transverse to the first portion of the linking member moves to a position between the substrate holding assembly and a securing hook extending from the substrate holding assembly, the hook preventing the linking member from being pulled out of the opening.

61. The method of Claim 60, wherein the linking member is L-shaped.

62. A substrate rotating system, comprising:

a shaped rotational shaft; and

a susceptor support correspondingly shaped to be joined with the rotational shaft so as to prevent rotational slippage between the shaft and the susceptor support.

63. The substrate rotating system of Claim 62, wherein the susceptor support comprises a downfacing socket shaped to receive the shaft.

64. The substrate rotating system of Claim 62, wherein the shaped rotational shaft includes a flat indentation.

65. The substrate rotating system of Claim 62, wherein the susceptor support comprises arms extending from a central socket, the arms being configured to support a susceptor.